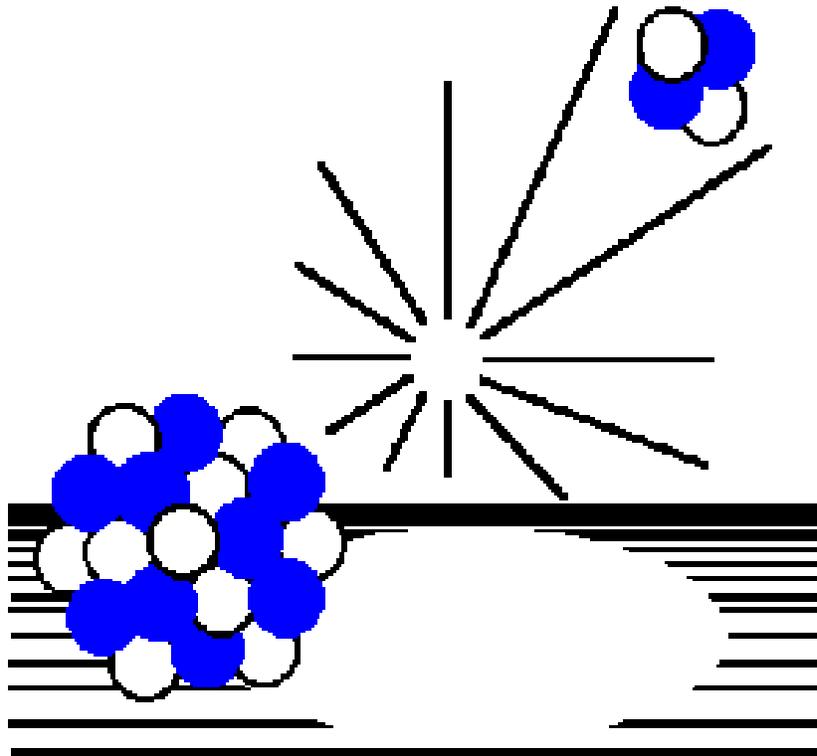

CAP88-PC Version 2.0 User's Guide



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1. About CAP88-PC Version 2.0

CAP88-PC Version 2.0 has been developed in a Windows 3.1 environment using Visual Basic (Version 3) and will run in a Windows 95 environment. Please refer to the section on Windows 95 environment for special instructions if necessary. CAP88-PC Versions 1.0 and 1.1 were developed in a DOS environment.

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2. General

2.1. Purpose

CAP88-PC provides a framework for developing inputs to perform full-featured dose and risk assessments in a Windows environment for the purpose of demonstrating compliance with 40 CFR 61.93(a). CAP88-PC executes the CAP88 model developed by EPA for assessments of both collective populations and maximally-exposed individuals. The complete set of dose and risk factors used in CAP-88 is provided. CAP88-PC differs from the dose assessment software AIRDOS-PC in that it estimates risk as well as dose, it offers a wider selection of radionuclide and meteorological data, it provides the capability for collective population assessments, and it allows users greater freedom to alter values of environmental transport variables.

2.2. Cautions

1. Dose and Risk estimates from CAP88-PC are applicable only to low-level chronic exposures, since the health effects and dosimetric data are based on low-level chronic intakes. CAP88-PC cannot be used to model either short-term or high-level radionuclide intakes
2. CAP88-PC is intended for use by health physicists with experience in dose assessment.
3. The CAP88 Model is based on the Gaussian plume model with its associated limitations.

2.3. Getting Started

The following is a procedure for entering appropriate data in CAP88-PC. Select New Dataset from the File Menu. Give the Dataset a descriptive Dataset Name and a Filename. The Dataset Name should be unique for each dataset, but this is not enforced by the program. The Dataset Name will appear in the Dataset List each time the Select Dataset form appears. The Dataset Filename should be unique as this name will be used to create a DOS text file to store the Dataset parameters. The Filename is limited to 8 characters and may not include a space, a pipe character (vertical dashes) or an asterisk, as these characters are not appropriate for DOS naming conventions. Two comment areas are provided for further documenting the dataset. These two 50-character text fields will be repeated on the first page of each Output Report file. Select OK to have the program create the file and open the 6-page tab form for data entry.

Select each tab form in turn and enter the appropriate data. The Page Down key may be used to change tab forms as each form is completed. If required data is missing when the dataset is saved (Save Dataset in the File Menu), the program will ask for the data to be entered. Save the dataset to the same filename or save the dataset to a new filename before executing CAP88-PC. From the Run Menu, select Execute CAP88-PC. Indicate the dataset to be executed. The input data and files are checked briefly, then the executable DOS programs are run. If your computer does not have enough

memory to execute the DOS programs, select the option to create an INPUT.DAT file, exit Windows, and execute the programs from DOS. Upon successful execution, Output Report files will be created. These Output Report files can be viewed and printed using the Print Preview.

Required Data: On the Facility Data tab form, the State must be selected, as the agricultural density fractions on the Agricultural Data screen are linked to the State selected. CAP88 requires that the input data include the location and filename of a valid Population File (Run Options tab form, for Run Type = Population) and a valid Wind File (Meteorological Data tab form). At least one nuclide must be entered (Nuclide Data tab form). The number of source tabs on the Nuclide Data tab form is controlled by the number of Sources entered on the Source Data tab form, so it is appropriate to enter and describe the emitting sources prior to entering nuclide data.

Sample Data: A sample Dataset (Reactive Metals), a sample Population File (RMIASHTA.POP) and a sample Wind File (ERIEPA.WND) have been provided. Do not select TESTDATA.POP as a Population File, as it is created with no population data and an error will occur when executing the CAP88 Model. Other sample Population Files and Wind Files may be extracted from compressed files using the Population File Library and the Wind File Library, respectively. These and other utility programs for modifying or creating Population Files and Wind Files can be found in the Execute Menu.

Many of the menu options appear on the floating/dockable Toolbar. Rest your cursor on the Toolbar icon to see the label for that icon. Use the mouse to select and drag the Toolbar to convenient locations.

Many data options appear as buttons or in drop down lists to facilitate and control data entry. Make appropriate selections to best describe the parameters of the scenario to be modeled. Most of the inputs will appear in appropriate Output Reports, to be evaluated in the context of the calculated data.

2.4. Regulatory Basis

On October 31, 1989 the Environmental Protection Agency (EPA) issued final rules for radionuclide emissions to air under 40 CFR Part 61, National Emission Standards for Hazardous Air Pollutants (NESHAPS). Emission monitoring and compliance procedures for Department of Energy (DOE) facilities (40 CFR 61.93(a)) require the use of CAP88 or AIRDOS-PC computer models, or other approved procedures, to calculate effective dose equivalents to members of the public.

2.5. CAP88 Model

CAP88 is named for the Clean Air Act Assessment Package - 1988. The CAP88 Model is a set of computer programs, databases and associated utility programs for estimation of dose and risk from radionuclide emissions to air. CAP88 is composed of modified versions of AIRDOS-EPA and DARTAB. The original CAP88 program is written in FORTRAN 77 and has been compiled and run on an IBM 3090 under OS/VS2, using the IBM FORTRAN compiler, at the EPA National Computer Center in Research Triangle Park, NC. CAP88 is distributed by the Oak Ridge National Laboratory Radiation Shielding Information Center (RSIC).

2.6. Technical Summary

A modified Gaussian plume equation is used to estimate the average dispersion of radionuclides released from up to six emitting sources. The sources may be either elevated stacks, such as a smokestack, or uniform area sources, such as a pile of uranium mill tailings. Plume rise can be calculated assuming either a momentum or buoyant-driven plume. Assessments are done for a circular grid of distances and directions for a radius of up to 80 kilometers (50 miles) around the facility. The Gaussian plume model produces results that agree with experimental data as well as any model, is fairly easy to work with, and is consistent with the random nature of turbulence.

There are a few differences between CAP88-PC and earlier versions of AIRDOS, PREPAR and DARTAB. CAP88-PC is optimized for doing population assessments. Population arrays must always be supplied to the program as a file, using the same format as the mainframe version of CAP88. Sample population files are supplied with CAP88-PC, which the user may modify to reflect their own population distributions. Population files for the mainframe version of CAP88 may be downloaded in ASCII format and used with CAP88-PC. CAP88-PC is programmed to use the distances in the population array to determine the distances used to calculate concentrations, to eliminate human error. CAP88-PC only uses circular grids; square grids are not an option.

Direct user input of dose concentrations is also not an option. Population distances are used for calculating concentrations for the midpoint of each sector. Population distances are specified in the Population File or, for an Individual Assessment, on the Run Options tab form.

CAP88-PC has the capability to vary equilibrium fractions; previously they were set to a constant of 0.7. The new method varies the equilibrium fractions depending on the distance from the source. Linear interpolation is used to determine the equilibrium fractions for distances that do not match the set distances given.

Agricultural arrays of milk cattle, beef cattle and agricultural crop area are generated automatically, requiring the user to supply only the State name or agricultural productivity values. The arrays are generated to match the distances used in the population arrays supplied to the code, and use State-specific or user-supplied agricultural productivity values. The state name (standard two letter abbreviation) must be provided on the Facility Data tab form. Users are given the option to override the default agricultural productivity values by entering the data directly on the Agricultural Data tab form. If Alaska, Hawaii, or Washington, D.C. are selected, agricultural productivity values are set to zero and must be provided by the user.

CAP88-PC is also modified to do either "Radon-only" or "Non-Radon" runs, to conform with the format of the 1988 Clean Air Act NESHAPS Rulemaking. "Radon-only" assessments, which only have Rn-222 in the source term, automatically include working level calculations; any other source term ignores working levels. Synopsis reports customized to both formats are automatically generated. Assessments for Radon-222 now automatically include Working Level calculations when only a single source term of RN-222 may be used in this option. Input of any additional radionuclides, even Rn-220, will cause CAP88-PC to omit working level calculations.

Organs and weighting factors are modified to follow the ICRP 26/30 Effective Dose Equivalent calculations, which eliminates flexibility on specifying organs and weighting factors. The calculation of deposition velocity and the default scavenging coefficient is also modified to incorporate current EPA policy. Deposition velocity is set to 3.5×10^{-2} m/sec for Iodine, 1.8×10^{-3} m/sec for Particulate, and 0.0 m/sec for Gas. The default scavenging coefficient is now calculated as a function of annual precipitation, which is input on the Meteorological Data tab form.

Only 7 organs are valid for the new Effective Dose Equivalent. Changing the organs and weights will invalidate the results. They are Gonads 25 percent, Breast 15 percent, R MAR 12 percent, Lungs 12 percent, Thyroid 3 percent, ENDOST 3 percent, and Remainder 30 percent.

2.7. References

This software is intended for use by health physicists experienced in dose assessment. The following references are recommended:

"Comparison of AIRDOS-EPA Predictions of Ground-Level Airborne Radionuclide Concentrations to Measured Values", S.K. Beal and S.C. Cohen, S. Cohen and Associates, 8200 Riding Ridge Place, McLean, VA 22102, H.J. Chmelynski, Jack Faucett Associates, Suite 200, 7300 Pearl St., Bethesda, MD 20814, B.S. Parks and J. Hardin, U.S. Environmental Protection Agency, Washington, D.C. 20460, 1986.

Briggs, G.A., "Plume Rise, AEC Critical Review Series", TID-25075, 1969.

EPA 520/1-89-005 Risk Assessment Methodology: Draft Environmental Impact Statement for Proposed NESHAPS for Radionuclides, Volume 1, Background Information Document, United States Environmental Protection Agency, Office of Radiation Programs, Washington, D.C. 20460, February, 1989.

Gifford, F.A., Jr., "Turbulent diffusion-typing schemes: A review", Nuclear Safety 17(1): 68-86, 1976.

International Commission on Radiological Protection, Recommendations of the International Commission on Radiological Protection, ICRP Publication 26, Ann. ICRP, 1, (1), Pergamon Press, 1977.

Moore, R.E., Baes, C.F.III, McDowell-Boyer, L.M., Watson, A.P., Hoffman, F.O., Pleasant, J.C., Miller, C.W., "AIRDOS-EPA: A Computerized Methodology for Estimating Environmental Concentrations and Dose to Man from Airborne Releases of Radionuclides", (Reprint of ORNL-5532), EPA 520/1-79-009, U.S. EPA Office of Radiation Programs, Washington, D.C., 20460.

ORNL-5952: PREPAR: A User-Friendly Preprocessor to Create AIRDOS-EPA Input Data Sets, Oak Ridge National Laboratory, Oak Ridge, Tennessee.

ORNL-7745: Estimates of Health Risk From Exposure to Radioactive Pollutants, Oak Ridge National Laboratory, Oak Ridge, Tennessee.

ORNL/TM-7105: A Combined Methodology for Estimating Dose Rates and Health Effects From Exposures to Radioactive Pollutants, Oak Ridge National Laboratory, Oak Ridge, Tennessee.

ORNL-5692/DE81030434 DARTAB: A Program to Combine Airborne Radionuclide Environmental Exposure Data with Dosimetric Health Effect Data to Generate Tabulations of Predicted Health Impact, Oak Ridge National Laboratory, Oak Ridge, Tennessee, November 1981.

Pasquill, F., "The Estimation of the Dispersion of Windborne Material", Meteorology Magazine, 90:33, 1961.

Rupp, E.M., Beall, S.E., Bornwasser, L.P., Johnson, D.H., "Dilution of Stack Gases in Cross Winds", USAEC Report AECD-1811 (DE-1620), Clinton Laboratories, 1948.

Slade, D.H. (ed.), Meteorology and Atomic Energy - 1968", U.S. Atomic Energy Commission/Division of Technical Information, USAED TID-24190, 1968.

Turner, D.B. "Workbook of Atmospheric Dispersion Estimates", Air Pollution Control Administration, Cincinnati, Ohio, 1969.

Van der Hoven, I., "Deposition of Particles and Gasses", pp. 202-208, In Slade, D. (ed.), Meteorology and Atomic Energy - 1968, U.S. Atomic Energy Commission, USAED TID-24190.

2.8. LAN Installation

The LAN Administrator will probably have to run the CAP88-PC Version 2.0 installation program because of LAN drive write-protection restrictions.

The CAP88-PC Version 2.0 installation program creates a program directory, with a default name of CAP88PC2, with several default subdirectories: DATA, DATASETS, OUTPUT, POPFILES, and WNDFILES. The CAP88-PC Version 2.0 installation program also writes the CAP88PCW.INI, NEWPOP.INI, NEWDOE.INI, NEWSTAR.INI, and NEWLTPOP.INI files to the Windows directory. The installation program does assume that the program directory and the Windows directory are on the same drive. The LAN Administrator should run the CAP88-PC Version 2.0 installation program naming the drive and program directory.

Installation:	Normal	LAN Example
Program directory	C:\CAP88PC2	N:\CAP88PC2
Windows directory	C:\WINDOWS	N:\WINDOWS

After LAN installation, the LAN Administrator may copy the all the .INI files listed above and create the program directories on the user's hard drive. If the files are moved, all the .INI files will have to be edited to change the drives listed under the headings [PROGRAM DIRECTORY] and [Installable ISAMs]. The LAN Administrator should then change the Working Directory named in the Windows File/Properties menu to be the directory that the users program files are copied to.

The installation program also checks for the DOS program SHARE.EXE being initiated from the AUTOEXEC.BAT file in user's the main directory. In the user's AUTOEXEC.BAT file, enter the following statement after the DOS PATH statement:

```
SHARE.EXE /L:500
```

2.9. Windows 95

There is a known problem with running CAP88-PC Version 2.0 in a Windows 95 environment that requires user intervention. When a DOS program is executed (via a DOS 'shell'), the user must maximize and close the DOS shell window. This problem occurs:

1. ...when executing CAP88... In the Run Menu, select Execute, or select the CAP88-PC Molecule icon on the toolbar. Select the dataset which will be used to execute CAP88, then select the OK button. Input data will be checked for completeness, then the program shells out to DOS three times. Each time the user must maximize and close the DOS shell when the status box at the bottom on the user's screen shows "Done".

CAP88 involves executing three FORTRAN programs in DOS: DEFAULT.EXE, AIRDOS.EXE, and DARTAB.EXE. The DOS shell to each of the three programs must be closed at the end of execution.

There is a DOS shell status bar at the bottom of the Windows 95 screen. The DOS shell status bar will display the name of the FORTRAN program and the run status. When the first FORTRAN program is completed, the DOS shell window will show the name DEFAULT (the FORTRAN program name) and the job status: Done. Click on the [up arrow] to maximize the window and click on the [x] in the upper right corner to close the DOS shell. This action must be repeated for the AIRDOS program and the DARTAB program, as their execution completes.

2. ...when executing the Stability Array/Wind File Generator program... When the user selects the Process button and provides the input and output filenames and selects the Run button, the DOS program STARDOE.EXE is executed. The DOS shell status bar will display the program name and the run status. When the job status shows Done, the user must maximize the window and close the DOS shell. Also, when the user selects the Create Wind File for CAP88-PC button, the DOS program WINDGET.EXE is executed. The user must again maximize the Status window and close the DOS shell.

2.10. Toolbar

CAP88-PC Version 2.0 is installed with a Floating and Dockable Toolbar. To Dock a Floating Toolbar, click and drag the toolbar to the top, bottom, left, or right sides of the screen. The Float a Docked Toolbar, click and drag the toolbar away from the edge of the screen. Most forms will appear below the toolbar, and the toolbar may need to be moved away

from the form, or in most cases the form may be moved by clicking and dragging the top of the form. Some forms, notably the Common Dialog form which assists the user in locating a file or selecting a drive and directory, will appear on top of the toolbar. This form may be moved away from the toolbar, if necessary. The File, Run, and Help Menus will also appear over the toolbar. This should not be a problem.

The Help Menu has two toolbar-setting features. Toolbar On/Off will be checked on the left if the toolbar is on. The toolbar may be set off indefinitely and the program will not be affected. Use Reset Toolbar if the video resolution is changed such that a toolbar is no longer in the display screen even the Toolbar On/Off is checked (on).

2.11. Uninstall CAP88-PC Version 2.0

The Uninstall icon will uninstall only those files that were installed with CAP88-PC Version 2.0. Any extracted or created Population and Wind Files, as well as any Datasets and Output Files, will not be deleted. If the Uninstall icon has been removed, run the UNWISE.EXE program located in the CAP88-PC install directory.

3. File Menu

3.1. New Dataset

Open a New Dataset by providing descriptive information in the New Dataset Information form and selecting OK. A set of six tabbed forms appears to assist in the preparation of an input file (dataset) containing the data needed to execute CAP88-PC.

3.2. Open Dataset

An existing dataset is selected and opened for review and modification. If the dataset name does not appear in the dataset list (down arrow), use the Maintenance option to locate and Restore an existing dataset.

3.3. Close Dataset

Close the open dataset without making any changes. Data revisions for a current session are made to a copy of the dataset. If Close Dataset is selected, the dataset will not have been updated, possibly resulting in a loss of data. If a New Dataset was opened, it will have been created and added to the dataset list, but will not have any data revisions saved.

3.4. Save Dataset

Save all data and any changes made to the opened dataset, using the filename of the opened dataset. The data entry tab forms are then closed. The user must save or close a dataset before the dataset may be used to execute the CAP88 Model (see Run/Execute).

3.5. Save Dataset As

Save all data and any changes made to the opened dataset, using the filename provided by the user. This operation creates a new dataset and a new file. The filename must be unique, or the file with the same name may be overwritten, with user approval.

3.6. Print Setup

This is a standard Windows form for reviewing and setting printer options. The Floating Toolbar can not be selected or moved when this form is open.

3.7. Print Preview

Select Print Preview to display and print CAP88-PC output reports. The output reports have the same filename as the dataset, but with CAP88-standard file extensions. Use the tabs on the Print Preview form to move from one report to another. Use the scroll bar to scroll down or up to view each report. When the Print Current View option is selected, the entire report shown in the tab window is printed. To print several reports at once, check the report boxes and choose the Print button.

3.8. Maintenance

There are two maintenance options, File Maintenance and List Maintenance. These options assist the user in archiving, deleting, restoring, and renaming Datasets, Population Files, and Wind Files, as well as maintain the lists that describe the Population Files and Wind Files.

3.9. File Maintenance

This menu item assists the user in archiving, deleting, restoring, and renaming Datasets, Population Files, and Wind Files. File Maintenance will perform the indicated operation and also maintain the file selection lists used in the data entry portion of the program. If the Windows File Manager is used to perform these operations, files selected from drop down lists may not be found.

3.10. List Maintenance

This menu item assists the user in maintaining Location Descriptions and Census Dates or Reference Dates, for Population Files and Wind Files, respectively. Select each file name and enter or revise descriptive information, then select OK to update the lists. If Cancel is selected, the lists will not be updated.

3.11. Convert SCR File

Use this option to locate, read, and reformat a dataset file (.SCR) that was created using the CAP88-PC Version 1 (DOS) program. CAP88-PC Version 2.0 stores and reads dataset files in the format of the INPUT.DAT file that is read by the FORTRAN programs comprising the CAP88 Model.

3.12. Create INPUT.DAT File

Some users will find difficulty executing the CAP88 FORTRAN programs from Windows (shell to DOS) due to the computer's memory constraints. The user may select this option to copy the selected dataset to a file named INPUT.DAT in the CAP88-PC working directory. (The working directory can be viewed in Windows by selecting the File/Properties menu item when the CAP88-PC 2.0 icon is highlighted.) The user can then exit Windows and, from DOS, change directory (CD) to the working directory and run the following programs to generate desired output (this order is mandatory for proper results):

DEFAULT,
AIRDOS,
DARTAB

After successful completion of these three programs, return to CAP88-PC Version 2.0 to view (Print Preview) the output files.

3.13.Exit

Close all files and exit the CAP88-PC Version 2.0 program. Any open Dataset must be saved or closed to exit the program properly.

4. Run Menu

4.1. Execute

Run the CAP88 Model. Before actually executing the assessment, the program will check to make sure that you have selected the following items in the dataset: a State, a Population File (if the run is a population assessment), a Wind File, and at least one Radionuclide. If the preceding items are present, the program will execute the selected dataset by shelling out to DOS to run the FORTRAN programs DEFAULT, AIRDOS, and DARTAB. If one or more of the required data items are missing, a message will be displayed so you will know to modify the dataset accordingly. If, for some reason, a Population File or Wind File has been selected but no longer exists, a message will be displayed and the programs will not be executed. (Some users may not have the computer memory required to execute these DOS programs from Windows. See Create INPUT.DAT File for instructions.)

4.2. Scan Population File Format

This menu item reads the indicated Population File and determines if the data is in proper format. No guarantees are made to the correctness of the data, though the distance increments are checked to be consecutively increasing.

The Population File Editor can be used to create or modify a Population File and maintain the proper file format. The Population file format should be as follows:

Row 1 should have a dollar sign (\$) in the first column. The location description, latitude, and longitude on row 1 are for information only to verify that the file desired is the file the user has selected. The number of distances associated with the population file must be in columns 68 and 69. The number of distances may be any integer between 2 and 20; single digit distances (2-9) should be in column 69.

Distances begin in row 2 and all numbers are right justified. The number of distances found in the file will be the number specified by NRAD. The distances are edgepoints of each sector (the midpoints used in the calculations will be calculated by the program) and are entered in the population file in kilometers. The CAP88 programs will multiply each distance by 1000 before calculating the midpoints and using them in the assessment. For example, the first distance in the sample file, .62 kilometers, will become 620 meters and the midpoint calculated from that will be 310 meters. There can be up to 20 distances, but the typical number of distances is 13. Only distances up to 80 kilometers should be used. The assessment is not valid for distances above 80 kilometers.

The population values are entered with distances across (columns) and directions down (rows); however, each row will not be a new direction. There will be 20 distances for each direction (regardless of the number of distances specified in the population file). The extra distances (usually 7) will simply contain zero. There will always be 8 population values per row with the first value ending at column 10 and each subsequent value ending at multiples of 10 with the last value per row ending in column 80. This means that for the direction N, the population values will be contained on the first, second and part of the third row of the distance-direction population values. The first population value for the next

direction, NNW, will be contained in columns 41 through 50 of the third row and subsequent values for direction NNW will be contained on the remaining part of the third row, the fourth, and part of the fifth row. There are 16 directions in counterclockwise order starting with North.

4.3. Population File Editor

This utility program assists the user in creating or displaying a Population File. An 'empty' Population File, TESTDATA.POP is provided as a template for building a properly formatted Population File. Any Population File intended for use with a CAP88-PC dataset should be able to be read, displayed, or printed by this program.

4.4. Population File Library

This utility program provides Population Files that were distributed with CAP88-PC Version 1. The files in the library are stored in a compressed format. Choose a location from the grid by clicking (highlighting) the grid row and download the Population File by selecting the Extract button. The Extracted Population File is in the proper format to be used by CAP88-PC.

4.5. Scan Wind File Format

This menu item reads the indicated Wind File and determines if the data is in the proper format. No guarantees are made as to the correctness of the data, though the sum of frequencies is checked. Frequencies should sum to 1.0000, within a tolerance of 0.0005 for rounding. The format of a Wind File is as follows:

Record 1 - three hexadecimal file marks are written by the GETWIND program. This record is ignored.

Record 2 - average wind speed (not used). [0000.00000]

Record 3 - wind direction frequency totals for each of the 16 wind directions. [0.0000] The numbers on this record should sum to 1.0000 within a tolerance of .0005 for rounding.

Records 4 through 10 - each record has 16 reciprocal-averaged wind speeds, for each of the 7 stability categories. [0.000]

Records 11 through 17 - each record has 16 true-averaged wind speeds, for each of the 7 stability categories. [0.000]

Records 18 through 33 - each record has frequencies for the 7 stability categories, for each of the 16 wind directions. [00000.0000] The numbers on these 16 records should sum to 1.0000 within a tolerance of .0005 for rounding.

4.6. Wind File Library

This utility program provides Wind File data for many National Weather Service (NWS) stations in a compressed format. The Wind File Library also contains the meteorological data issued with CAP88-PC Version 1. Choose a weather station from the grid by clicking (highlighting) the grid row and download the station file by selecting the Extract button. The Extracted Wind File is in the proper format to be used by CAP88-PC. .

4.7. Stability Array/Wind File Generator

The STAR Distribution Program assists the user in extracting and processing National Climactic Data Center (NCDC) or site-specific meteorological data based on several popular methods. Each of the processing methods creates a Stability Array file (.STR) that is then used to create a Wind File for input to CAP88-PC. If the user is not an experienced meteorologist-modeler, it is strongly suggested that the user work with a meteorologist-modeler to prepare NCDC or on-site meteorological data for input to CAP88-PC.

There are 96 records in the Stability Array file, one for each of the 16 wind directions (N, NNE, NE, ENE, E, ESE, SE, SSE, S, SSW, SW, WSW, W, WNW, NW, and NNW) and Stability Category (A-F) Sixteen records are entered for

Stability Category A, then Stability Category B, etc., through Stability Category F. Stability Classes used for CAP88-PC are: A - extremely unstable, B - unstable, C - slightly unstable, D - neutral, E - slightly stable, and F - stable.

All records are of the same format. The total of all the frequencies entered on the 96 records should add to 1.00000 within a tolerance of .05 percent. The format of a Stability Array (STAR) record follows:

Column 1 is blank.

Columns 2-4 contain the wind direction, right justified (E would be in column 4, and NE would be in columns 3 and 4).

Column 5 is blank.

Column 6 contains the Stability Category, A through F.

Column 7 is blank.

Columns 8-14 contains the frequency for winds 1-3 knots (for example 0.00041).

Columns 15-21 contains the frequency for winds 4-6 knots.

Columns 22-28 contains the frequency for winds 7-10 knots.

Columns 29-35 contains the frequency for winds 11-16 knots.

Columns 36-42 contains the frequency for winds 17-21 knots.

Columns 43-49 contains the frequency for winds greater than 21 knots.

Once a Stability Array file has been created, use the button Create Wind File for CAP88-PC to run the program which converts the STAR file to a Wind File for input to CAP88-PC. A common dialog box will appear for the user to identify the STAR file to be converted. The Create Wind File options runs the program WINDGET.EXE. WINDGET.EXE is identical to the GETWIND.EXE program used by CAP88-PC Version 1, but is now compatible with the filenames and pathnames provided by the call from a Windows program.

For the format of a Wind File, see Scan Wind File Format.

5. New Dataset Information

5.1. New Dataset Information Form

Use this form to locate, name, and describe the Dataset to be created. A New Dataset is created, even if the user later Closes a file without saving changes.

Drive, Dataset

Select a drive that the new dataset will be copied to. The current drive is suggested. Choosing a network drive or a floppy drive that will not always be available to the program will create an error if the drive is not found when the dataset is selected again for modification or execution.

Directory, Dataset

Select a directory that the New Dataset will be copied to. The datasets subdirectory in the program directory is suggested. Change the directory chosen by double-clicking on the main directory and selecting the desired subdirectory.

Name, Dataset

Enter a Dataset Name, up to 20 characters; do not use apostrophes or double quotes. This name will appear in the drop down list on the Select Dataset screen, and in the label of the data entry tabbed forms. The Dataset Name should be descriptive enough to allow accurate selection of a Dataset.

Filename, Dataset

Enter a Dataset Filename, up to 8 characters. This filename must not contain any spaces, piping (vertical dashes), or asterisks, as these are not valid for DOS naming conventions. This filename must be unique in the directory in which it will be created.

Comment, Dataset

(Optional) Enter Comments, up to 50 characters. Do not use an apostrophe or double quotes, all other characters and spaces are allowed. The Comments should accurately describe the assessment scenario.

Comment Additional, Dataset

(Optional) Enter Comments, up to 50 additional characters. Do not use an apostrophe or double quotes, all other characters and spaces are allowed. The Comments should accurately describe the assessment scenario.

Cancel Button

Select the Cancel button to exit the New Dataset form without creating a new Dataset.

OK Button

Select the OK button to create the New Dataset with the parameters defined. The New Dataset Information form will be closed and the CAP88-PC data input tab forms will appear.

6. Select Dataset Information

6.1. Select Dataset Form

Use this form to select a dataset for the desired operation. Except for the Dataset Name List, all other fields on this form are read-only and will be filled with appropriate data when a dataset is selected.

Name List, Dataset

Click on the down arrow to display the list of datasets recognized by CAP88-PC. Select a dataset name from the list by clicking once on the name. To add a dataset to the Dataset Name list, either Open a New Dataset or use the File Maintenance function to Restore an existing Dataset.

Cancel Button, Select Dataset

Close the Select Dataset form, without performing the desired operation.

OK Button, Select Dataset

Use the selected dataset for the desired operation. The Select Dataset form will be closed and the CAP88-PC data input tab forms will appear.

7. Print/View

7.1. Print/View Form

Use this form to view CAP88-PC Output Reports and select which reports, if any, will be printed.

Tabs, Output Report

Click on these tabs to change the CAP88-PC Output Report being displayed. If a tab is missing, that report was not created, or was deleted from the directory. Return to the Run Option tab of the data entry form to view report selection information. If necessary, select a new report option (Yes/No), save the data, and re-execute CAP88-PC.

Print Check Boxes , Output Report

Select the boxes next to the report names for reports to be printed (in their entirety). An X will appear in the selected box. Click again to remove the X and un-select a report. The selected reports will not be sent to a printer until the Print button is selected.

Print Current View Button

Print the entire CAP88-PC Output Report shown in the view window. Partial reports cannot be printed with this viewer. If partial reports are desired, another text editor may be used to view and print relevant portion of the report.

Cancel Button, Print Preview

Close the Print Preview form.

Print Button

Any Output Reports for the dataset that have an X in the check box will be printed (in their entirety).

8. Maintenance Operations

8.1. File Maintenance Operation Form

The File Maintenance Operations described below will perform the operation described - as well as - maintain the lists supported by CAP88-PC Version 2.0. Warning: Using the Windows File Manager to perform these operations will result in the program lists not being maintained. Files deleted using the Windows File Manager will not be found when selected from the Dataset list, the Population File list, or the Wind File list. Files renamed or copied using the Windows File Manager will not appear in the Dataset list, Population File list, or the Wind File list until Restored using this option.

Archive, Delete, Restore, Rename

Select the operation to be performed. Archive will copy the selected file(s) to a location (diskette, directory, etc.) indicated by the user and remove the filename from any lists maintained by the CAP88-PC Version 2.0 program. Archive does not compress the files (all CAP88-PC files, excluding Output Reports, are rather small text files). Delete will erase file(s) from the location selected and removes the filename(s) from the Dataset list, Population File list, or Wind File list, as appropriate. Restore copies file(s) from another location and adds the filename(s) to the Dataset list, Population File list, or Wind File list, as appropriate. Restore checks each filename to be restored for uniqueness, and will ask before overwriting a file with the same name. Rename changes the name of the file indicated by the user and revises the Dataset list, Population File list, or Wind File list, as appropriate. For example, the user may wish to rename Wind Files extracted from the Wind File Library to change the filename from the Station ID to a city or location name that is more easily recognizable.

Select Type of File for File Maintenance Operation

Selection of the Dataset file type will allow the user to select an existing dataset from the Dataset Name list. Selection of the Dataset file type will also perform the identical operation on any Output Report files that exist for the Dataset. Selection of the Population File type will remove from, add to or revise the Population File list when files are deleted, restored, or renamed. Selection of the Wind File type will remove from, add to or revise the Wind File list when files are deleted, restored, or renamed. Use the List Maintenance option to revise file descriptions and date information for the Population Files or Wind Files.

Cancel Button, Select Maintenance Operation

Closes the Select Maintenance Operation form.

OK Button, Select Maintenance Operation

If both a File Maintenance Operation and a File Type have been selected, the OK button will submit the request and the appropriate form will appear for selecting the particular file to be altered. If either the File Maintenance Option or the File Type has not been selected, an error message will appear.

8.2. Select File

Select a file from the current directory or Locate a file in another directory.

Population File Directory

Choose this option if the Population File appears in the Population File list in the current directory. The current directory is a subdirectory named Popfiles that is subordinate to the directory that CAP88-PC Version 2.0 was installed to.

Custom Population File

Choose this option to locate a Population File in a directory other than the Popfiles subdirectory. The user is provided a form to select a drive, directory, and filename for the desired file.

Population File List

If the Population File resides in the Population File Directory, a Population File list will be displayed and a Population File may be chosen from that list. If the Population File is not in the default directory, then select the Locate button to choose the drive and directory of the desired file.

Wind File Directory

Choose this option if the Wind File appears in the Wind File list in the current directory. The current directory is a subdirectory named Wndfiles that is subordinate to the directory that CAP88-PC Version 2.0 was installed to.

Custom Wind File

Choose this option to locate a Wind File in a directory other than the Wndfiles subdirectory. The user is provided a form to select a drive, directory, and filename for the desired file.

Wind File List

If the Wind File resides in the Wndfiles subdirectory, a Wind File list will be displayed and a Wind File may be chosen from that list. If the Wind File is not in the current directory, then select the Locate button to choose the drive and directory of the desired file.

Cancel Button

Close the Select File form.

OK Button

If a filename appears on this form, the next archive form will appear. If no file has been selected, an error message will appear.

8.3. Save File As Form

Change the name of the file if desired. The name of the selected file appears at the top of the form.

Dataset Filename

Filenames are limited to 8 alphanumeric characters and exclude blanks, asterisks, and pipe (vertical dishes) characters.

Population Filename

Filenames are limited to 8 alphanumeric characters and exclude blanks, asterisks, and pipe (vertical dashes) characters.

Wind Filename

Filenames are limited to 8 alphanumeric characters and exclude blanks, asterisks, and pipe (vertical dashes) characters.

Cancel Button

Close the Save File As form.

OK Button

Perform the desired operation.

8.4. Change List Information Form

Use this form to enter list information for both the Population File list and the Wind File list. **NO CHANGES ARE MADE UNTIL THE OK BUTTON IS SELECTED**, at which time both the Population File list and the Wind File list are updated. If changes are made and the Cancel button is selected, **THE LISTS WILL NOT BE UPDATED**.

Population File Directory

Choose this option to change the list of Population File information (description and census date) for files in the Popfiles subdirectory.

Population File List

Select the down arrow to display and select the Population File description and census date to be displayed and altered.

Population File Description

Enter a location description, limited to 36 characters, that will identify the Population File.

Population File Census Date

Enter the year that the population assessment was performed.

Wind File Directory

Choose this option to change the list of Wind File information (description and reference dates) for files in the Wndfiles subdirectory.

Wind File List

Select the down arrow to display and select the Wind File description and reference dates to be displayed and altered.

Wind File Description

Enter a weather station description, limited to 36 characters, that will identify the Wind File.

Wind File Period of Record

Enter the year(s) that meteorological data was collected for frequency distribution analysis.

Cancel Button

Close the Change List Information form, **WITHOUT** updating either the Population or Wind File lists.

OK Button

Close the Change List Information form, after updating both the Population File list and the Wind File list.

9. Dataset Data

9.1. Facility Data

The Facility Data tab form is used to describe the facility and time period to be modeled. On the Facility Data tab form, a State must be selected from the list provided. The State selected will determine the agricultural values used on the Agricultural Data Tab Form. After all known Facility Information is entered, use the Page Down key to advance to the next tab form.

Facility Name (Optional)

The Facility Name is used for identification purposes only. The Facility Name appears on each Output Report.

Address Line 1(Optional)

The Facility Address (line 1) appears on each Output Report

Address Line 2(Optional)

The Facility Address (line 2) appears on each Output Report

City (Optional)

The City that the Facility is located in or near appears on each Output Report.

State Name (Required)

The State name is required because it is used by the program to establish values for agricultural arrays of beef cattle, milk cattle, and crop production according to EPA-accepted state-wide averages. A state name must have been selected for an assessment to be executed. State names are chosen from a list box, which appears when you click on the down arrow when the state field is selected. To use the list box search feature, press any letter key and the list box automatically goes to the first state beginning with that letter. Selection of Hawaii, Alaska, or the District of Columbia will result in zeros being loaded on the Agricultural Data tab form.

Zip Code (Optional)

Enter the Zip Code and Zip Plus 4 Code, if known.

Emission Year (Optional)

Choose the year in which the radionuclide emissions occurred from the drop down list. If a year is desired that is not in the drop down list, use a database file editor to add the year to the file YEAR.DBF.

Source Category (Optional)

The Source Category is for information only. No particular category is enforced at this time.

Comments Line 1(Optional)

Comments (line 1) are restricted to 50 characters and appear on the first page of each Output Report. Comments also appear on the Select Dataset form for additional identification of the dataset.

Comments Line 2(Optional)

Comments (line 2) are restricted to 50 characters and appear on the first page of each Output Report. Comments also appear on the Select Dataset form for additional identification of the dataset.

9.2. Run Options

The Run Options tab form is used to describe the population to be assessed and select optional output tables and reports. CAP88-PC Version 2.0 uses population arrays in the same format as the mainframe CAP88 program. A sample population assessment is provided with CAP88-PC Version 2.0. Other population assessments may be downloaded from the Population File Library. Users are encouraged to create their own population arrays using the Population File Editor supplied with the CAP88-PC Version 2.0 program. Census data or population survey data should be obtained for the facility and area to be modeled.

Assessment Run Type

The Assessment Run Type must be selected to determine the source of the population data. If an Individual Assessment is chosen, the midpoint distances for the assessment areas must be entered. If a Population Assessment is chosen, the data will be read in from a Population File. The Population File may be selected from the drop down list.

Population File Directory

A Population File is required for a Population Assessment Run Type. The Population File Editor in the Run Menu can be used to generate a Population File in the proper format. Also, a sample population assessment may be downloaded from the Population File Library. The distances entered in the Population File are endpoint distances and are converted to midpoint distances by CAP88-PC. Population Files can be located and maintained in the Popfiles subdirectory, or can be selected from another directory by choosing the Custom Population File option.

Custom Population File

If the Population File resides anywhere except in the Popfiles subdirectory, choose this option and select the Locate button to locate and select the Population File for the assessment. To get a Custom Population File into the Population File Directory, use the File Maintenance option to Restore a Population File, then use the List Maintenance option to record the population description or location and census date (year of population estimation, adjustment or assessment).

Population File Location

Enter the drive, directory, and filename of the desired Population File or select the Locate button to browse the drives and directories to locate the Population File to be used for the assessment.

Generate Genetic Effects?

If No is selected, genetic effects tables will be suppressed in the Synopsis (.SYN) Output Report.

Create Dose and Risk Factor File?

Select Yes to generate a Dose and Risk Factor Output Report file (.FAC) when this assessment is used to execute CAP88-PC. Dose and Risk are estimated by combining the inhalation and ingestion intake rates, air and ground surface concentrations with the dose and risk conversion factors used in CAP88-PC. The effective dose equivalent is calculated using the weighting factors in ICRP Publication 26. Risks are based on lifetime risk from lifetime exposure, with a nominal value of 4E-4 cancers/rem. Doses and risks can be tabulated as a function of radionuclide, pathway, location and organ. CAP88-PC also tabulates the frequency distribution of risk, showing the number of people at various levels of risk. The risk levels are divided into orders of magnitude, from one in ten to one in a million. Dose and Risk estimates from CAP88-PC are applicable only to low-level chronic exposures, since the health effects and dosimetric data are based on low-level chronic intakes. CAP88-PC cannot be used for either short-term or high-level radionuclide intakes.

Create Concentration Table File?

Select Yes to generate a Concentration Table Output Report file (.CON) when this assessment is used to execute CAP88-PC. The Concentration Table may be quite large if many radionuclides are selected. Radionuclide concentrations in air, rates of deposition on ground surfaces, concentrations in food and intake rates to people from ingestion of food produced in the assessment area are calculated by the model. Estimates of the radionuclide concentrations in food, leafy vegetables, milk and meat consumed by humans are made by coupling the output of the atmospheric transport models with the US Nuclear Regulatory Commission Regulatory Guide 1.109 terrestrial food chain models.

Create Chi/Q Table File?

Select Yes to generate a Chi/Q analysis (.CHI) of the scenario provided for execution of CAP88-PC. Chi/Q values are used to convert radionuclide release values to concentrations.

Midpoint Distances

Midpoint distances are required for an Individual Assessment. These distances are the distances at which the doses and risks are calculated, in meters. The distances must be integers between 1 and 80000 meters (inclusive). A message will be displayed if you enter a distance outside this range. At least one distance must be entered for the dataset to execute. If no distances are entered, the AIRDOS program will abort. The distances entered in the cells must be contiguous and ascending, that is, no cells can be skipped and the midpoint distances must increase from left to right in each row. Cells (at the end) may be left blank after the midpoint distances have been entered.

Population File List

Select the down arrow to see the descriptive information and Population File names in the Popfiles subdirectory.

Locate Button

Select this button to get a form to browse the drives and directories for a particular Population File.

9.3. Meteorological Data

The Meteorological Data Tab Form is used to supply site meteorological data for the dispersion modeling.

Wind File Directory

A Wind File is required for CAP88 execution. The Wind File Library in the Run Menu can be used to obtain a Wind File in the proper format. These Wind Files were created from the National Weather Service data which is available for many weather station sites. If the user has on-site meteorological data, select the Stability Array Distribution program in the Run Menu to process and convert on-site data to a properly formatted Wind File. Wind Files can be located and maintained in the Wndfiles subdirectory, or can be located by choosing the Custom Wind File option.

Custom Wind File

If the Wind File resides anywhere except in the Wndfiles subdirectory, choose this option and select the Locate button to locate and select the Wind File for the assessment. To get a Custom Wind File into the Wind File Directory, use the File Maintenance option to Restore a Wind File, then use the List Maintenance option to record the location and dates for which the meteorological data was collected.

Wind File Location

Enter the drive, directory, and filename of the desired Wind File or select the Locate button to browse the drives and directory to locate the Wind File to be used for the assessment.

Annual Precipitation

The average annual precipitation (in centimeters) at or near the site.

Annual Ambient Temperature

Average annual ambient temperature (in degrees Celsius) at or near the site. Temperatures above 200 degrees are assumed to be in degrees Kelvin and will be converted and shown as degrees Celsius when the dataset is re-opened.

Height of Lid

The height of the tropospheric mixing layer (in meters) at or near the site. This field must contain a positive non-zero value. A zero value will cause the AIRDOS program to abort when the dataset is executed.

Locate Button

Select this button to get a form to browse the drives and directories for a particular Wind File.

Wind File List

Select the down arrow to see the descriptive information and Wind File names in the Wndfiles subdirectory.

9.4. Source Data

The Source Data Tab Form is used to identify the type of emitting source and the dimensions of each emitting source being assessed. Stack and Area Sources cannot be mixed in a single assessment. While up to six stack or area sources can be modeled, all the sources are modeled as if located at the same point. The same plume rise mechanism (Buoyant, Momentum, Fixed, or Zero) is used for each source. Also, area sources are treated as uniform. Variation in radionuclide concentrations due to complex terrain cannot be modeled. Errors arising from these assumptions will have a negligible effect for assessments where the distance to exposed individuals is large compared to the stack height, area, or facility size.

Source Type

The emitting sources must be identified as stacks (point) or area sources. While up to six stack or area sources can be modeled, all the sources are modeled as if located at the same point. The same plume rise mechanism (Buoyant, Momentum, Fixed, or Zero) is used for each source. Also, area sources are treated as uniform.

Number of Sources

Up to six (6) emitting sources (stacks or areas) may be modeled. The fields for Height, Diameter/Area, and Plume Rise Type (if Momentum or Buoyant) change as the number of emitting sources change, so select the number of sources before entering any associated data.

Area Dimensions

Height (in meters) and Area (in square meters) of the Area Source.

Plume Rise Type

Select the Plume Rise Type for the dispersion modeling. The choices are Buoyant, Momentum, Fixed, and Zero. The same plume rise mechanism is used for each source.

Plume Rise for Pasquill Categories

Plume Rise for each Pasquill Category for a Fixed Plume Rise Type. Enter the actual plume rise (in meters) for each of the seven Pasquill Categories (A through G) if a Fixed Plume Rise Type is selected. If a Zero Plume Rise Type is selected, zero is entered for each of the seven Pasquill Categories (A through G), and no further action is required.

Heat Release Rate or Exit Velocity

Enter the heat release rate (in calories per second) for a Buoyant Plume Rise Type or enter the exit velocity (in meters per second) for a Momentum Plume Rise Type.

Stack Dimensions

Height (in meters) and Diameter (in meters) of each Stack or Point Source.

9.5. Agricultural Data

The Agricultural Data Tab Form is used to enter agricultural factors which will be applied to the dispersion data to estimate uptake of emitted radionuclides into the food chain.

EPA Food Source Scenarios

Selection of each EPA Food Source Scenario (Urban, Rural, Local, Regional, and Imported) will result in different fractions appearing in the 9 cells which describe the fraction of Vegetable, Milk, and Meat produced in the area, or imported to the area. The fractions are not editable unless the Entered scenario is selected, in which case fractions must be entered by the user. The Entered fractions must total to 1.0 for each column or the user will be asked to re-enter the fractions or make another scenario selection.

EPA Food Source Scenarios - Fractions

Selection of each EPA Food Source Scenario will result in different fractions appearing in the 9 cells which describe the fraction of Vegetable, Milk, and Meat produced in the area or imported to the area. These fractions are not editable unless the Entered scenario is selected, in which case fractions must be entered by the user. The Entered fractions must total to 1.0 for each column, otherwise, the user will be asked to re-enter the fractions or make another scenario selection.

Beef Cattle Density

Sample distributions of beef cattle density are provided by EPA for the assessment area using average agricultural productivity data for each of the fifty states. Since data was not available for Alaska, Hawaii, and the District of Columbia, the user must supply relevant agricultural data for these areas. Using zero in this field will result in an error when the program is executed.

Milk Cattle Density

Sample distributions of milk cattle density are provided by EPA for the assessment area using average agricultural productivity data for each of the fifty states. Since data was not available for Alaska, Hawaii, and the District of Columbia, the user must supply relevant agricultural data for these areas. Using zero in this field will result in an error when the program is executed.

Land Fraction Cultivated for Vegetable Crops

Sample distributions of crop productivity are provided by EPA for the assessment area using average agricultural productivity data for each of the fifty states. Since data was not available for Alaska, Hawaii, and the District of Columbia, the user must supply relevant agricultural data for these areas. Using zero in this field will result in an error when the program is executed.

9.6. Nuclide Data

The Nuclide Data Tab Form is used to select and describe characteristics of the radionuclides emitted by each source. Two complex chains of nuclides may be selected: U-238, Uranium; and Th-232, Thorium. CAP88 accounts for the buildup of decay products in each of the complex chains. There are also ten simple chains which each have one decay element: Cs-137, Cesium ; Ba-140, Barium; Mo-99, Molybdenum; Pb-210, Lead; Pu-241, Plutonium; Sr-90, Strontium; Zr-95, Zirconium; Ru-103, Ruthenium 103; Ru-106, Ruthenium 106; and Ce-144, Cerium. When one or more of these radionuclide chains are selected, a dialogue box will appear with the information that the nuclide is the beginning of a chain, and asking if the chain should be added. If Yes is selected, the entire chain will be added to the list. If No is selected, only the individual nuclide will be added to the list.

Nuclide List

At least one nuclide should be selected, otherwise the dataset will not be saved or executed (the dataset may, however, be closed). Select a Nuclide from the drop down list by clicking on the down arrow in the Nuclide field and entering the first letter of the Nuclide name. The list will jump to nuclides starting with the letter selected. Click on the nuclide name to be added. Nuclide names appear for each emitting source, but a release rate of zero will show that the nuclide is not emitted from a particular source. If the nuclide selected is a member of a chain, a message will appear to request if the nuclide will be treated as an individual or whether the chain members should be entered. The program counts the nuclides entered and will impose a limit of 36 nuclides to remain compatible with CAP88. After each nuclide is selected, the nuclide's size and class information appears in the data grid. The nuclide size and class data applies to the nuclide emitted from every source. Use the drop down lists to choose other valid size and class selections (if applicable) for each nuclide.

Nuclide Release Rate

There will be Source Tabs (from 1 to 6) above the data entry grid for entry of the Release Rate for each nuclide from each source. If a source does not emit a nuclide in the list, the Release Rate will be zero for that source. The release rates can be entered in decimal or exponential notation.

Particle Size

The default particle size will appear for the selected nuclide. Select the down arrow to change the particle size, if necessary. Select one of the allowed Activity Medium Aerodynamic Diameter Micrometers (AMAD) for particulates. Particle size (AMAD) in micrometers for inhaled particles is 0.0, 0.3, 1.0, or 3.0. Some nuclides are restricted in their particle size allowances, and gases get a particle size assignment of 0.

Nuclide Class

Select one of the allowed lung clearance classes for inhaled particles. If a Class field contains 'None', then class is not applicable to that particular radionuclide. After each nuclide has been selected, the default clearance class appears. Some nuclides are restricted in their clearance class allowances. Use the drop down list as a guide to the valid classes for each nuclide.

10. Glossary of Terms

AIRDOS - A computer model developed by EPA for estimating environmental concentrations and dose to man from airborne releases of radionuclides.

Buoyant - (plume rise type) AIRDOS calculates plume rise using Briggs' equations for hot buoyant plumes. The plume rise is added to the actual physical stack height to determine the effective stack height. The plume centerline is shifted from the physical height to the effective stack height as it moves downward. The plume centerline remains at the effective stack height unless gravitational settling of particulates produces a downward tilt, or until meteorological conditions change.

CAP88 - CAP88 (which stands for Clean Air Act Assessment Package - 1988) is a set of computer programs, databases and associated utility programs for estimation of dose and risk from radionuclide emissions to air. CAP88 is composed of DEFAULT (a program to verify EPA-mandated input data) and modified versions of AIRDOS-EPA and DARTAB.

CAP88-PC - The CAP88-PC computer model is a DOS-based software package which allows users to perform full-featured dose and risk assessments in a personal computer environment for the purpose of demonstrating compliance with 40 CFR 61.93(a). CAP88-PC provides the CAP88 methodology for assessments of both collective populations and maximally-exposed individuals. The complete set of dose and risk factors used in CAP88 is provided. CAP88-PC differs from the dose assessment software AIRDOS-PC in that it estimates risk as well as dose, it offers a wider selection of radionuclide and meteorological data, it provides the capability for collective population assessments, and it allows users greater freedom to alter values of environmental transport variables. CAP88-PC Version 2.0 will yield exactly the same results as CAP88-PC.

Celsius - A unit of temperature for which 0 degrees Celsius is the temperature at which water freezes and 100 degrees Celsius is the temperature at which water boils.

Concentration Tables - The Concentration Tables Output Report (.CON) contains the estimated radionuclide concentrations at various distances from the emitting source.

Chi/Q Tables - The Chi/Q Table Output Report (.CHI) consists of a table of Chi/Q values for each radionuclide in the assessment. Chi/Q values are used as a conversion factor (units are sec/m³) to convert release (Ci/sec) to concentration (Ci/m³).

DARTAB - DARTAB is a computer model developed by EPA to calculate and produce dose and risk tables from AIRDOS intermediate output using dose and risk factors from RADRISK data files.

Dataset - A dataset refers to the data file (.DAT) containing input data for CAP88.

DEFAULT - DEFAULT is the first of the three FORTRAN programs that comprise CAP88. This program compares dataset data submitted for execution to the default data contained in the DEFAULT.DAT file for meteorological data, inhalation and ingestion rates, water use and agricultural productivity that are the values approved by EPA to demonstrate compliance as required by 40 CFR 61.93(a). Any modification to the DEFAULT.DAT file must be approved by EPA if the modified parameters are used to demonstrate

compliance per 40 CFR 61.93(a). When a DEFAULT.DAT file containing user altered default values is used, there will be a CAUTION message on the beginning page of the SYNOPSIS Output Report stating that defaults have been changed. The specific changes will be listed on the following page including the default description, the original default value, and the user specified value. This will alert the originators and anyone using the outputs that defaults have been changed and what changes have been made.

Dose and Risk Conversion Factors - The Dose and Risk Conversion Factors Output Report (.FAC) contains ingestion, inhalation, air immersion, and ground surface dose conversion factors; absolute health risk, years of life loss, and risk equivalent conversion factors for cancers due to ingestion, inhalation, air immersion, and ground surface exposure; and genetic dose conversion factors for ingestion, inhalation, air immersion, and ground surface exposures.

Dose and Risk Equivalent Summary - The Dose and Risk Equivalent Summary Output Report (.SUM) contains the summaries of calculated exposures and risks, broken down by organ, pathway, radionuclide, and cancer.

Fixed - (plume rise type). AIRDOS accepts user-supplied values for plume rise for each Pasquill stability class.

General Data - The General Data Output Report (.GEN) contains input data, radionuclide-dependent variables, radionuclide-independent variables, agricultural data, and Radon working levels.

Insolation - The incoming solar radiation that reaches the earth's atmosphere.

Kelvin - A temperature scale which measures from absolute zero (0 K = -273.16 C) and follows the Celsius gradients such that $K = 273 + C$. In CAP88-PC Version 2.0, temperatures entered on the Meteorological data screen will be interpreted as degrees Kelvin if a number greater than 200 is entered as the Annual Ambient Temperature.

Momentum - (plume rise type). AIRDOS calculates plume rise using Rupp's equation for momentum dominated plume rise.

Pasquill Stability Class - Lettered categories A through F which describe stability class ranges.

Synopsis - The Synopsis Output Report (.SYN) contains a composite of the most generally used information generated by the assessment.

Weather Data - The Weather Data Output Report (.WEA) contains the wind speeds and stability categories used for the assessment.

Zero - (plume rise type). Plume rise for each Pasquill stability class is zero.